

Viscosity is the most misunderstood aspect of oil and yet it is the most important.

Viscosity is the force required to shear (break) the oil at a certain speed and temperature. Oils work because they have viscosity; the drag of a rotating part pulls oil from a low-pressure area into a high pressure area and "floats" the surfaces apart. This is called "hydrodynamic lubrication" and crank bearings depend on it.

Oil must be capable of flowing at low temperatures, so that it gets around the engine in a fraction of a second at start-up and must protect engine components at high temperatures without evaporating or carbonising and maintain adequate oil pressure.

The numbers on every can of oil indicate its performance characteristics when new but there are many misconceptions on what these numbers actually mean.

For multigrade oils you will see two numbers (for monograde oils only one). The first is followed by a "w" and is commonly 0, 5, 10, 15 or 20. The second number is always higher than the first and is commonly 20, 30, 40, 50 or 60.

The first and second numbers ARE NOT related.

The "w" number (0, 5, 10, 15 or 20)

When multigrade oils first appeared, a low temperature test called "w" (meaning "winter" not weight) was introduced.

Using a "Cold Crank Simulator, the test measures the oils ability to flow at low temperatures.

ALL oils are THICKER at low temperatures than at high temperatures but the lower the "w" number, the quicker the oil will flow at low temperatures.

The second number (20, 30, 40, 50 or 60)

This number is known as the SAE (Society of Automotive Engineers) number and is measured in "Centistokes" (cst) at 100degC.

Centistokes (cst) is the measure of a fluid's resistance to flow (viscosity). It is calculated in terms of the time required for a standard quantity of fluid at a certain temperature to flow through a standard orifice. The higher the value, the thicker the oil.

An oils cst at 100degC determines it's SAE rating within the following parameters.

SAE 20 = 5.6 to less than 9.3cst
SAE 30 = 9.3 to less than 12.5cst
SAE 40 = 12.5 to less than 16.3cst
SAE 50 = 16.3 to less than 21.9cst
SAE 60 = 21.9 to less than 26.0cst

a decent oil always falls in the middle of the spec so an SAE 40 will be around 14cst.

ALL oils labelled 40 must fall within the SAE parameters at 100degC so everything from a monograde 40 to multigrade 0w-40, 5w-40, 10w-40, 15w-40 are the same thickness at 100degC.

Summary

Cold start.

A 5w-40 will flow better than a 10w-40.
A 10w-50 will flow better than a 15w-50
A 5w-40 is the same as a 5w-30

At operating temperatures.

A 10w-50 is thicker than a 10w-40.
A 15w-50 is thicker than a 5w-40
A 0w-40 is the same as a 10w-40

Multigrades offer flexibility but manufacturers recommended viscosities should be observed unless modifications have been made that affect engine temperatures or the car is being used off road.